

CORNELL EXTENSION BULLETIN 909



A sparrow

C. B. RAYMOND



Contents

	PAGE
Soil and soil preparation	4
Varieties	5
Seed treatment	6
Starting asparagus	6
Setting the crowns	7
Manure and fertilizer	8
Weed control	9
Chemicals in established plantings	9
Chemicals for seedlings and young plantings	10
Dilutions	11
Harvesting and marketing	11
Asparagus in the home garden	12
Insects	14
Disease	15
Rust	15

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Cover illustration: Good care has maintained heavy production and almost a perfect stand in this 25-year-old asparagus bed photographed in August.

Asparagus

C. B. RAYMOND



HISTORY records asparagus as a favorite delicacy more than 2000 years ago. It is quite unlike other vegetables for, when properly started, asparagus last for many years. Records show that some garden plantings more than 35 years old and some commercial plantings more than 25 years old still produce excellent crops. The profitable life of a planting depends largely upon good soil drainage and proper annual care to build up strength in the roots each summer for the crop of the following year.

Asparagus is a native of temperate regions and is, therefore, best adapted to sections where either low temperature or drought stops growth and gives the plant a rest period. The greater the top growth, the better the next season's crop. Asparagus is grown successfully as far south as Georgia and north well into Canada. Commercial acreage of asparagus is largest in California, New Jersey, Washington, Illinois, and Michigan. There are about 25,000 acres in New Jersey, and reports indicate that the acreage is increasing quite regularly. Acreage is also considerable in the market-garden sections of most cities throughout the Northern States. The canning and freezing industry takes a large portion of the crop from the States with large acreages.

The 1950 census recorded 783 New York farmers growing asparagus for sale on a total of only 1,191 acres. Home freezers and freezer lockers are creating a demand for a good, fresh locally grown supply by thrifty families and by those especially fond of asparagus. The acreage in New York State has, however, been declining gradually in recent years, mostly because of the high cost of harvesting.

There is little information on the cost of growing asparagus, but costs are naturally high. It is two years before a planting yields a harvest, and the third year there is only a partial harvest season. Then, too, after the planting is in production, it must still be heavily fertilized annually, and the unavoidable cost for almost daily cutting and marketing is high.

The yield of an asparagus planting should increase annually up to the seventh or eighth year. On well-drained soil and with proper annual care, yield should continue at, or very near, the high level for several seasons. One season's neglect or damage to the crowns will, however, result in a drop in yield that is difficult to regain. A poor stand of plants is the greatest single cause of most poor yields from the first year through the entire life of the planting.



Figure 1. The difference between a poor and a good start with asparagus. The picture at the right shows a well-set planting before the end of the first season. The one at the left shows the result at the middle of the second year after careless setting.

Soil and soil preparation

Since asparagus will occupy the land for many years, the choice of a suitable soil and its thorough preparation are most important. A deep, loose soil, such as sandy loam, is best, as loose soils warm up earlier in the spring and thus give an earlier harvest. Good drainage is absolutely necessary for the long life of a planting. Even in loose, sandy loam soils roots in low pocketed areas where water settles are almost certain to be killed in a year or two. Heavy soils warm slowly, thus delaying the spring growth. Both the heavy soils and those that are stony produce a higher proportion of crooked spears than do the loose less stony soils. Fortunately for the home gardener (page 12), asparagus grows well on a wide range of soils and few, if any, home gardens need to be without this early spring vegetable of superior quality.

Asparagus is an acid-sensitive crop and does best on soils ranging from only slightly acid to slightly alkaline. If the soil reaction is below a pH of 6.0, enough lime should be applied previous to planting to bring the reaction slightly above this point. This is best done a year or more before the plants are to be set. Tests should also be made of the subsoil. If this is acid, lime may well be added in the bottom of the furrow opened for the roots.

Ross C. Thompson, Horticulturist of the United States Department of Agriculture, says in *Farmers' Bulletin 1646, Asparagus Culture*, "Asparagus is found growing naturally on the banks of streams and near salt marshes, where the salt content of the soil is high and the reaction somewhat alkaline. It does well in moist places if the water table does not come within 4 feet of the surface. Asparagus

will thrive in soils having a salt content too high for many other crop plants, but will not tolerate extreme acidity."

Since asparagus is to occupy the land for a number of years, more than the usual amount of soil preparation is justified.

Land infested with quack or other perennial grasses or with perennial broadleaved weeds should not be used for asparagus. Preparation for planting should be started a year or more in advance of transplanting the crowns, to reduce weed population to a minimum. During this time it is advisable to work into the soil as much stable manure or other organic matter as is possible. This seems to help to give good growth the first year. Where it is impossible to incorporate organic matter properly, a thick legume crop, such as one of the clovers, planted a year before starting asparagus, helps to control weeds and at the same time adds a good supply of organic matter, high in nitrogen.

Varieties

For years there were two rather distinct general types of asparagus. Today it is difficult to distinguish the many varieties of asparagus because to the eye the differences are mainly slight variations in the color of the spears. Near the start of the century, rust had become a troublesome disease of asparagus. Two rust-resistant varieties were developed, the Mary and the Martha Washington. They are similar, but the Martha Washington is some-

what more rust-resistant. The Mary Washington, however, is slightly earlier in maturity and more vigorous and has, therefore, been the leading variety. In the fall of 1953, rust was again alarmingly abundant in asparagus throughout the Northeastern States. This raises the question of whether the Washington varieties have lost some of their resistance to the disease. The reappearance of the disease at least emphasizes the need for caution in the choice of variety to grow. The choice of a variety should always be determined by its resistance to rust.

Figure 2. Rust as seen on the tops in the fall and winter.



Seed treatment¹

Disease organisms in the soil frequently kill many seedlings either before or after they emerge. By the application of a calomel seed treatment, it has been possible to obtain good stands even under severe disease conditions. To make this treatment, 1 pound of seed is thoroughly mixed with 4 ounces of a dry calomel-gum abaric mixture (such as Calogreen).

Ceresan M has not proved so effective a seed treatment for the control of asparagus seedling blight as has calomel, but it is much cheaper and simpler to use. Where the disease has been mild in the past, or it is not known whether it is present, it is recommended that 1 level tablespoon measure (about one-third of an ounce) of Ceresan M be thoroughly mixed with each pound of asparagus seed.

When a small quantity of seed is to be treated with either of these materials, it is not absolutely essential that the chemical be measured accurately. A small excess of the chemical may be mixed with the seed, and then the excess dust thoroughly screened off.

Starting asparagus

Asparagus plantings should be given the best possible start. The choice of roots and the care in setting them will be reflected throughout the entire life of the planting. If only a few plants are needed, it usually is best to buy them. When a fairly large planting is to be made, it may be ad-

visable for a grower to produce his own crowns. Unless, however, one has suitable soil and is willing to give an asparagus nursery planting the best of care throughout the season, it is advisable to buy large, one-year crowns from an experienced grower.

Asparagus seed is slow to germinate. Often it is as much as five or six weeks before the seedlings appear above ground, depending upon soil temperature, moisture, and depth of coverage. Mixing in a little radish seed shows the row until the asparagus starts. Germination can be hastened by soaking the seed at a temperature of 85° to 90°F. for four or five days prior to planting. Little benefit is derived from either a shorter soak or soaking at a lower temperature. The seeds must be dried rather quickly on absorbent paper or cloth and then sowed immediately. Soaked seed must be thoroughly dried if it is to be treated. Even after thoroughly dried there is still danger of having an excess of the chemical adhere to the seeds. Treated seeds should not be soaked.

The seeds should be sown at the rate of not more than 10 or 12 seeds per linear foot of row and should be covered with about 1 inch of soil. Since thinning is difficult, the seeds must be individually spaced for best root development. The crowns may be dug with a potato digger, with the ordinary mold-board plow, or with a spading fork if there are only a few. Here again care should be exercised to prevent breaking the roots.

¹By R. E. Wilkinson of the Department of Plant Pathology at Cornell University.



Figure 3. Three one-year-old asparagus plants from the same seed planting. The longest roots are about 10 inches. The smallest plant is good, but will not have the vigor of the larger ones at the start. Care should be taken to make certain that large crowns are not two or more intertwined. The storage root tips are pointed unless they have been broken off.

Crowns, whether home grown or purchased, should be rigidly graded. The small ones and those badly damaged should be discarded. The variation in size to be expected in one-year-old roots is shown in figure 3. Only the two larger ones should be used, although small plants can be made to do well if planted by themselves when freshly dug and given better than average care. Good one-year-old roots are always to be preferred to older ones.

There are both male and female asparagus plants, but it is impossible to tell them apart until they have grown big enough to develop blossoms. There is not enough difference in their production to justify sorting them. Female plants generally have a

few more buds and therefore produce a few more spears, but they are not so large, so the total production is about the same.

Setting the crowns

It is best to set asparagus as early in the spring as soil conditions permit. The sooner the roots can be set back in the ground after they are dug, the stronger each plant will be. Crowns that have to be held after they have been dug should be kept as dormant as possible by storing them at a temperature only slightly above freezing and where they will neither dry out nor mold or rot.

The land should be well plowed and thoroughly fitted before the furrows are opened, as cultivation and

weed control are more than usually difficult the first year. Furrows can be opened with a mold-board plow, used in both directions. A little hand shoveling is generally needed to provide proper setting of crowns. From 6 to 10 inches is deep enough to plant crowns in loose soil and from 4 to 7 inches is preferable in the heavier soils. With present-day equipment, most growers space the rows from 4 to 6 feet apart. In the small plantings, it may be more practical to have the rows closer than 4 feet.

It is a good practice to apply superphosphate and lime in the bottom of the furrow before setting the crowns, or immediately after the crowns have been set. The superphosphate may well be used at the rate of from 5 to 10 pounds for each 100 feet of row. The limestone application should vary depending on the need as shown by soil tests.

The crowns should be spread out as best they can, with the buds on the top. The crowns are best spaced about 18 inches apart. With rows 4 feet apart, this requires 7260 crowns to an acre; while rows 5 feet apart require only 5808 crowns to an acre. Only from 1 to 2 inches of top soil is well firmed over the crowns. Deep covering smothers and kills most of the weaker crowns, and walking or kneeling directly on them is also a bad practice. After the tops are all well started, a little more soil is worked into the furrow to cover all weeds. This practice should be repeated as necessary to control weeds so that by early or

mid summer the furrow is entirely filled.

Manure and fertilizer

As already indicated it is helpful to work a good supply of manure into the soil before setting asparagus. Once the planting is well established, asparagus does well with relatively liberal application of chemical fertilizers. On the lighter soils, however, the addition of manure is always helpful. On many farms, other crops give greater response from the use of manure than would the established asparagus bed.

Recommendations for established plantings are for 750 to 1000 pounds to an acre of a fertilizer such as 10-10-10 analysis. If nitrogenous fertilizer is being applied separately, a 5-10-10 or 8-16-16 analysis is recommended. Fertilizer has little or no effect on the current year's crop, but it does stimulate larger top growth which in turn helps to build more strength in the roots for the following year.

Most persons prefer to apply about one-half of the complete fertilizer in the spring, discing it in with the tops, and to apply the other half at the end of the cutting season and disc or harrow it in. It is an excellent practice to apply additional readily available nitrogenous fertilizers right after the end of the cutting season, unless from 400 to 600 pounds of cyanamid has been used on the rows for weed control. Applications of manure, especially poultry manure, justify a reduction in the quantity of commercial fertilizer used.

Weed control

Weed control for a perennial vegetable such as asparagus is more difficult than for the annual vegetables. A year of neglect allows the soil to become so foul with weed seeds that control is difficult and expensive for years to come and may ruin the planting. Some hand hoeing is likely to be necessary to keep down the weeds in the first and second year of the planting.

Weed control starts in the spring with thorough discing as early as possible to incorporate the old dead tops, but it must not be deep enough to damage the crowns. Depth regulators or shields on the harrow are a wise precaution. There is no need to harrow more than 3 inches in depth, and even this depth may be too much on shallow plantings or old beds.

Cultivation easily keeps the space between the rows free of weeds, but the weeds and the volunteer asparagus seedlings in the row call for special control practices. Some years the thick mats of volunteer asparagus seedlings are the worst weeds. The old conventional method has been to cut all the asparagus to the ground after the weeds are 2 or 3 inches in height and then to harrow or cultivate over the crowns. This is a destructive wasteful practice, and chemicals now make it possible to prevent this loss.

Chemicals in established plantings²

The control of weeds in established plantings of asparagus can be simpli-

fied by the use of one of the following materials.

Cyanamid

Cyanamid (granular) from 200 to 300 pounds an acre in bands about 18 inches wide on the row has been satisfactorily used by some growers for many years to control broadleaved weeds. Three pounds is enough for 100 feet of row or on light sandy soils it should be made to cover 125 feet. The total application during any year should not exceed 800 pounds. Cyanamid is most effective just as the weeds are coming up. It is relatively ineffective after the weeds are more than 1 inch tall. Cyanamid contains about 20 per cent nitrogen, so its use as a weed-killing agent should also be considered as supplying part of the fertilizer need. Unfortunately it stimulates weeds and grass that are not controlled. Cyanamid is most effectively used early in the morning when the weeds are wet with dew or the soil is damp and there is prospect of a bright sunny day. It is easily and rapidly applied from a container such as a pail with holes in the bottom.

Salt

Salt (any finely ground grade) is effective as a spray on many kinds of weeds not more than 3 inches in height. Two pounds should be dissolved in each gallon of water and the weeds thoroughly wet, preferably in the early part of a bright day. This brine solution can be applied with any type of sprayer or sprinkler. A much

²By R. D. Sweet of the Department of Vegetable Crops at Cornell University.

greater quantity of salt is needed if it is to be used dry on the soil.

2,4-D

2,4-D (2,4-dichlorophenoxyacetic acid) can be applied either prior to or following cutting at the rate of 1 pound per acre to control broadleaved weeds. (Dilutions are discussed on page 11.) 2,4-D must *not* be applied to the fern growth. Best results are obtained when weeds are less than 3 inches tall. Grasses are not usually controlled. *Caution:* 2,4-D drift or vapors and spray tank residues are harmful to most vegetables, ornamentals, and fruits. The label on container should be read carefully.

Crag-1

Crag-1 (2,4-dichlorophenoxyethyl sulfate) has about the same potential weed-killing ability as 2,4-D, but is less toxic to fern growth. It must be applied before the weeds sprout because weeds that are above ground at the time of spraying are not killed. Approximately 3 pounds per acre, or 1 ounce per 1000 square feet, are required. (Dilutions are discussed on page 11.) The effectiveness of this chemical is dependent on surface-soil moisture. For satisfactory results when applied on dry soil, there must be at least $\frac{1}{4}$ inch of rain or irrigation within the next five days.

Di-nitro materials

Di-nitro materials, such as P.E. or Premerge, at the rate of 2 gallons (6 pounds) per acre, or 1 cup per 1500 square feet, can be applied prior to the cutting season and immediately

after cutting to control broadleaved and grassy annual weeds. (Dilutions are discussed on page 11.) These chemicals leave a yellow stain on skin and clothing.

PCP

PCP (pentachlorophenol) and/or NaPCP (sodium salt of pentachlorophenol) can be used in the same way and with the same results as the di-nitros. PCP is applied at the rate of 10 pounds an acre or $\frac{1}{4}$ pound per 1000 square feet. Double this rate is needed if NaPCP is used. (Dilutions are discussed on page 11.) NaPCP is marketed in small quantities. One trade name is Garden Weeder.

Urea

Urea compounds, such as CMU, have recently come into use. Applied at the rate of 2 pounds per acre, or $\frac{1}{2}$ ounce per 1000 square feet control of broadleaved and grassy annual weeds is excellent. (Dilutions are discussed on page 11). Applied just prior to the cutting season and at the end of the seasons harvest one can expect good results with CMU under a wide range of soil and weather conditions. The duration of weed control is longer with CMU than with any of the other above-mentioned chemicals. The present formulation requires constant vigorous agitation of the diluted spray to prevent settling.

Chemicals for seedlings and young plantings

Seedling asparagus and young plantings can be weeded with salt, di-nitros, PCP, and urea, provided they are ap-

plied prior to emergence of the young plants.

Dilutions

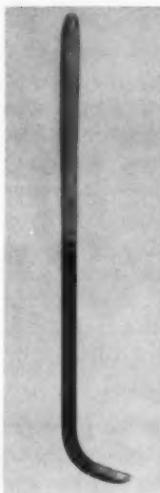
In contrast to sprays for insect and disease control where quantity of chemical per gallon of water is important, herbicides are effective over a wide range of dilution. Three important points should be kept in mind when the volume of water is being determined. *First*, the quantity of chemical needed on a given area. More volume is required for Crag-1 at 3 pounds than for 2,4-D at 1 pound. *Second*, conventional pesticide equipment is engineered to apply from 75 to 125 gallons per acre. Special weed sprayers need to be used if low-volume (5 to 15 gallons an acre) spraying is desired. *Third*, low-volume sprayers

are almost entirely limited to liquid formulations of weed killer. Wettable powder formulations usually need a water volume of at least 30 or 40 gallons to the acre to prevent excessive trouble with nozzle plugging. One should always remember that it is the quantity of herbicide used on a given area that determines its effectiveness regardless of the quantity of water in which it is diluted.

Harvest and marketing

For the future good of a planting, harvest should not start until after two full years of growth and then should be discontinued after three or four weeks. Plantings that make a real vigorous start are sometimes harvested for a short period the second year, but

Figure 4. A new type of asparagus knife for cutting spears at the soil surface or slightly above. This gets all that is usable of every spear, saves strength of the roots, prevents damage to young spears not yet emerged, and is easier to use.



it is best to give the crowns two full seasons start.

Harvest, of course, starts as early in the spring as the spears are tall enough to cut. Maximum yields can be expected if the spears are allowed to get from 8 to 10 inches above ground. Under some growing conditions, they have to be harvested shorter than this because the head tends to break open. Some buyers want much shorter spears. Because of rapid growth, it is best commercially to harvest all spears more than 5 inches tall. The tender spears are very sensitive to frost damage, so it is sometimes advisable to cut all spears that can be sold rather than risk their being frozen. Cut asparagus loses quality rapidly if left in the hot sun, but keeps well at a cool temperature.

Harvest is generally terminated late in June or the first of July. It should be stopped much earlier if the spears become spindly. Spindly spears are a good warning for the need of better care and more fertilizing. As beds grow older, the proportion of smaller spears is likely to increase.

In commercial plantings, the common practice has until recent years always been to cut from 1 to 3 inches below the surface. Many home gardeners have, however, always harvested by cutting at the surface of the soil or slightly above. This prevents damaging many spears that are not yet visible. Commercial cutting or breaking at the surface has become a rather common practice when the crop is to be used for freezing and canning. It

is easier and saves time and labor in field and factory. Some recent investigations in Michigan indicate that surface breaking or cutting may be a desirable way to harvest market asparagus. It adds to the appearance of the product on the market and reduces the gross handling weight as much as 25 to 45 per cent, all of which is waste.

Packaging for market in New York State seems to be almost entirely a local matter. The grading for most local markets is similar to the U.S. grades. The main bases for sorting are diameter and length of the spears, tightness of the tip, and length of white butts. The trimmed bunches may vary from 6 to 10 inches in length, with weights of from $\frac{1}{2}$ pound to as much as $2\frac{1}{2}$ pounds. A light rubber band near each end of the bunches is a quick, easy, cheap way to hold the spears together.

Asparagus going to local markets is frequently sold in bulk, with spears of random length and with little or no grading except to remove the spindly ones. The United States Department of Agriculture has established grade standards for asparagus for fresh market and for processing. Since these are subject to change and to local modification, it is best to get the latest information from a local office of the State Department of Agriculture or from the County Extension office.

Asparagus in the home garden
IN addition to the general recommendations already given and

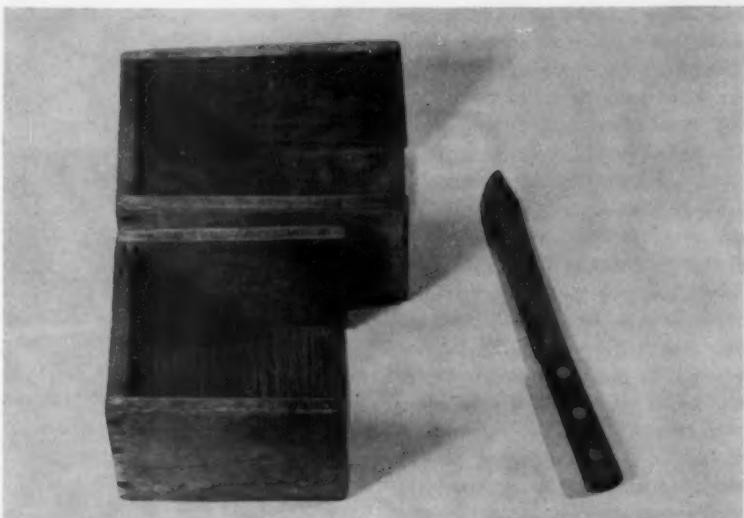


Figure 5. Boxes of several lengths are convenient for assembling various length spears preparatory to grading and bunching. The spears are placed with the tips touching the closed end, then the excess length of butts is cut off.

some special references to home plantings, numerous other practices are suitable for home gardeners. Any family that truly likes asparagus and that has any garden space can well plan to grow its own supply. While good drainage and loose soil are essential to successful commercial production, the home gardener can have reasonably satisfactory yields in spite of some adversities. He can justify going to more trouble in improving the drainage, even making raised beds if necessary. He can use large quantities of lime to correct soil acidity, and the presence of stones makes little difference because he cuts above ground. If space is limited, the crowns can be set as close as 12 inches apart each

way. Such close plantings do not last so long as those with wider spacings, but with heavy fertilizing they give greater yields from small areas.

Part of a perennial flower garden is an excellent place for a home asparagus bed. Here, where there is no plowing, the roots may be set quite close to the surface. A simple method is to sow seed 2 inches apart in furrows only about 4 inches deep and to cover the seed with about 1 inch of soil. After nicely started, the plants are thinned to 12 or more inches, depending upon space available. In addition to saving work, this should give good enough growth for a short harvest the third season.

Weed control can be greatly simpli-

fied by the use of a loose mulch. Sawdust, wood chips, buckwheat hulls, shavings, ground corncobs, and various other materials can be used to shut out weed growth but still permit asparagus spears to come through. Some gardeners find it practical to fence in their asparagus and then permit the chickens or geese to weed the young plantings as well as the established bed each year after the cutting season is over. In a sizeable home garden that is plowed, it may be more practical to put the asparagus row in the center of the garden so annual vegetables will be on each side. Space should be left at each end to work around the row. This prevents the quack, wild morning glory, or other persistent weeds from creeping in from the side.

Transplanting asparagus crowns from an old bed to start a new one is a hard, laborious job that is seldom satisfactory. Taking up the wild plants that are abundant in some sections and transplanting them to the garden is likewise slow and unsatisfactory.

Poultry litter and poultry manure are excellent for the asparagus planting, but superphosphate should be added. Home gardeners who do not have manure for their asparagus may well use their regular garden fertilizer, such as 5-10-5, 5-10-10, or any other complete fertilizer, at the rate of about 5 pounds to each 100 square feet.

Insects⁸

Two kinds of closely related beetles,

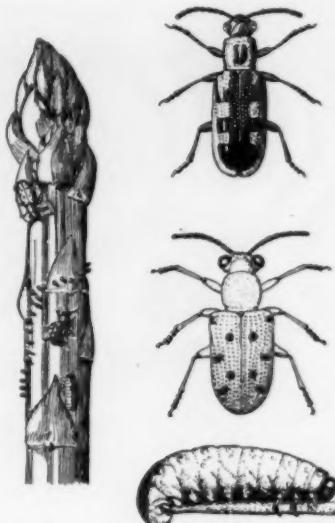


Figure 6. Asparagus beetles: adult beetles, larva, and eggs on asparagus tip; on right: common asparagus beetle; spotted asparagus beetle and larva, or slug.

each about $\frac{1}{4}$ inch long attack asparagus. One known as the *common asparagus beetle* has red and yellow markings (figure 6). The other which may be equally abundant is orange colored with 12 black spots. Both cause crooked shoots and scar and discolor the tender tips. Both lay numerous small, black eggs which stand on end any place on the spears and on the fern growth. In a few days the eggs hatch into grayish slug-like young which immediately devour the foliage.

In plantings that are being harvested, the best control is to leave a few trap plants to develop tops. A 1 per cent rotenone dust is highly effective

⁸By R. W. Leiby of the Department of Entomology at Cornell University.

against both the beetles and the larvae. In the plantings not yet in production, and after the harvest season in all asparagus plantings, either the 1 per cent rotenone dust, a 5 per cent DDT dust, or a DDT spray, gives good beetle control. The DDT spray should be made at a strength of 1 pound of 50 per cent wettable powder to 50 gallons of water. Applications are most effective just as the young slugs appear. Protection of the fern growth is important to the building of strength in the storage roots for the next season's crop and to reduce the beetle population the early part of the next season. On small plantings, the slugs on the foliage are easily and quickly killed by drawing the foliage stems through gloved hands.

Disease⁴

Rust

At present there are no serious diseases of asparagus. Rust (caused by *Puccinia asparagi*) may be present occasionally. The bushy tops of the plants become covered with reddish or black pustules. This prevents the normal manufacture of food and its storage in the roots, thus decreasing the succeeding season's yield. The rust over-winters mostly in the form of teliospores that can cause infection of the young shoots in the spring. The rust fungus thrives best where there

are few dashing rains but where dew or fog is prevalent. Dry soils are favorable for its development.

Control

It is advisable to burn the diseased tops late in the fall. In Illinois, instead of burning, a dormant application of a 1 per cent Elgetol solution, from 600 to 800 gallons an acre, applied at a pressure of 400 pounds, reduced somewhat the spring stage of the fungus. The spray can be put on the old plants either in the fall or the spring. During the cutting season, all plants should be kept cut. Only resistant varieties should be planted. Among these, Palmetto and Argentuil are fairly safe. The most resistant ones, however, are Mary Washington and Martha Washington, which are being used generally in New York. A few of the Washington strains put on the market are not fully resistant. A selection known as *Paradise* and certain numbered strains from California proved susceptible under New York conditions. Care should be taken therefore to get truly resistant strains, then it will not be necessary to spray.

Plantings of all known-susceptible varieties should be pulled up and destroyed. Escaped susceptible plants in the community must be eradicated if regular plantings are to be protected.

⁴By Charles Chupp of the Department of Plant Pathology at Cornell University.

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